

National Climatic Data Center

DATA DOCUMENTATION

FOR

**DATASET 5913 & 5914
(DSI-5913 & DSI 5914)**

**Unisys Radio Acoustic Sounding System
RASS-6 & -60 (6 min & 60 min)**

February 18, 2004

National Climatic Data Center
151 Patton Ave.
Asheville, NC 28801-5001 USA

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1. Abstract: Since 1990, the Forecast Systems Laboratory (FSL) has operated the Wind Profiler Demonstration Network (WPDN) to demonstrate and assess the utility of wind profiler technology in a quasi-operational environment, and to help define operational specifications for a possible future U.S. national network.

The first phase of the WPDN was completed in May 1992 with the installation of a network of 32 wind profilers in the U.S. Near continuous real-time data from this network are available to meteorological centers around the world.

The second phase of the WPDN is the addition of Radio Acoustic Sounding System (RASS) sensors to 8 network sites. This phase began in 1993 with the installation of the first RASS unit at Platteville, CO.

RASS is a technique that remotely measures atmospheric (virtual) temperature by combining wind profilers and acoustic sources in such a way that temperature profiles are produced with the same temporal- and spatial-resolution as the radar. The wind profiler measures the speed of refractive index perturbations induced by sound waves generated with the acoustic waves generated with the acoustic sources. This allows the measurement of the local speed of sound as the acoustic waves ascend through the atmosphere. Since the speed of sound is proportional to the square root of the virtual temperature, profiles of virtual temperature are generated at the same heights and temporal frequencies as the wind measurements. Maximum height coverage is determined by attenuation of sound, which is a function of radar frequency and meteorological conditions, such as temperature, humidity, and wind speed.

Temperature measurement capability is from -55 degrees Celsius to +45 degrees Celsius with 0.3 degree resolution. Instrumented height range is 6.0 km to be compatible with previous experimental data accumulated to 5.25 km. Range gating is maintained at 250-meter increments.

Shelter-housed system equipment consists of a small rack containing a dual channel audio amplifier and digitally controlled audio sweep generator. RASS signal processing is performed by a dedicated signal processor installed in the existing signal processor chassis. The data processor incorporates additional software to perform the control, monitoring, and algorithm functions. Four acoustic transducers (one in each corner of the antenna array) are used to provide a broad wavefront to maximize the received radar echoes.

2. Element Names and Definitions:

RASS data is transmitted to the control center by both landline (6 minute) and GOES (hourly) systems. GOES RASS data consists of the average temperature profiles prior to GOES transmissions. Landline data contains temperature profiles measured within the preceding six minute cycle. Each transmission format has been extended to include RASS data.

The following four blocks have been added to the landline format and immediately follow the spectral data block for non-radiometer-selected profilers or follow the radiometer data block for radiometer selected sites.

RASS data description block (mode 3, submode 22) -	204 bytes
RASS data block (mode 3, submode 1) -	156 bytes

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RASS spectral data description block (mode 3, submode 22) - 188 bytes
 RASS spectral data block (mode 3, submode 1) - 538 bytes
 Additional new bytes - 1086

RASS Data Description Block

Number of Element Sets: 12
 Number of Bytes/Section: 150
 Number of Sections: 1

Element Set Mnemonic	Start Byte	Number of Bytes/Element Set	Number of Bytes/Element	Data Rep. Code	Units Code (Octal)
FGH	0	2	2	0	3
ABA	2	2	2	0	37
ABE	4	2	2	0	37
VGW	6	2	2	0	3
VGS	8	2	2	0	3
PRP	10	2	2	0	102
TDA	12	2	2	0	23
NSA	14	2	2	0	23
TSP	16	2	2	0	23
RSP	18	44	2	0	23
TMP	62	44	2	0	2
RVV	106	44	2	0	23

Notes:

1. RSP, TMP and RVV use 2 bytes per element.
2. ABA and ABE are included, in the spirit of the original format specifications, to show that the temperature profile is along the vertical beam. PRP and TSP (assumed to be 512) are included to fully define the radar parameters used in the calculation of the temperature data.
3. If RASS data were not acquired, for any reason, during the 6-minute cycle being reported, the RSP, TMP and RVV fields will be zeroed. The remaining fields may be zeroed or can be filled in. Data is valid for the RASS cycle numbers that have been selected via the PMT.

GOES Data Transmission Format

RASS Format Code: 244

The minimum transmission is 22 bytes of temperature scaled to fit into the range 1 to 240 (-75...+75 into 1...240). The value 0 signifies no temperature available.

The information word follows the number of bytes i.e. 22 for TMP only, 44 for TMP followed by RSP and 66 for TMP, RSP followed by RVV. RSP and RVV are scaled identically as the wind RSR and RVV data sent over GOES.

RASS PMT Display Operations

The following pages show PMT displays of:

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Landline Output Selections Menu
 RASS Data Description Block
 RASS Data
 RASS Operations Menu
 System LRU Status

Data Layouts for RASS_6 and 60 Data

Parameter Name	Elements	Units	F	xx	yyy	Width	Description
LOC_TIME_YEAR		Years	0	04	001	12	Year of observation
LOC_TIME_MONTH		Months	0	04	002	4	Month of observation
LOC_TIME_DAY		Days	0	04	003	6	Day of observation
LOC_TIME_HOUR		Hours	0	04	004	5	Hour of observation
LOC_TIME_MINUTE		Minutes	0	04	005	6	Minute of observation
LOC_TIME_PERIOD		Minutes	0	04	008	12	Time period of displacement in minutes
LOC_TIME_SIGNIFICANCE		Code table	0	08	021	5	Time significance
LOC_LATITUDE		Degrees	0	05	001	25	Station latitude (high accuracy)
LOC_LONGITUDE		Degrees	0	06	001	26	Station longitude (high accuracy)
LOC_STATION_HEIGHT		Meters	0	07	001	15	Height of station above sea level
LOC_INITIAL_HEIGHT		Meters	0	07	006	15	Height above station
LOC_HEIGHT_INCREMENT		Meters	0	07	005	15	Height increment
REPEAT_03		Descriptors	1	03	022	0	Repeat the following 03 descriptors 22 times
Repeat_04							
D6_RASS_QC	(1-22)	Code table	0	25	034	4	NOAA Wind Profile QC Test results
D60_RASS_QC							
D6_RASS_RSP	(1-22)	Decibels	0	21	192	7	RASS spectral peak power
D60_RASS_RSP							
D6_RASS_TEMP	(1-22)	Degrees Kelvin	0	12	007	12	RASS virtual temperature
D60_RASS_TEMP							
RASS_CHECKOUT_FLAG		Code table	0	62	021	2	Profiler in RASS checkout mode flag

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3. **Start Date:** 19950201

4. **Stop Date:** Ongoing.

5. **Coverage:**

- a. Southernmost Latitude: -90.0S
- b. Northernmost Latitude: 90.0N
- c. Westernmost Longitude: -180.0W
- d. Easternmost Longitude: 180.0E

6. **How to Order Data:**

Ask NCDC's Climate Services about the cost of obtaining this data set.

Phone: 828-271-4800

FAX: 828-271-4876

E-mail: NCDC.Orders@noaa.gov

7. **Archiving Data Center:**

Archive Branch
National Climatic Data Center
151 Patton Avenue
Asheville, NC 28801

8. **Technical Contact:**

National Climatic Data Center
151 Patton Avenue
Asheville, NC 28801

9. **Known Uncorrected Problems:** None.

10. **Quality Statement:**

11. **Essential Companion Datasets:**

12. **References:**

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